NAME: Key Worksheet 10.2 A

Complete each problem. Don't forget to check conditions for confidence intervals and tests of significance. Write all sentences/conclusions, and include units.

1- Here are the IQ test scores for and SRS of 33 seventh-grade girls in a Midwest School District.

114	100	104	89	102	91	114	114	103	105	109
108	130	120	132	111	128	118	119	86	72	100
111	103	74	112	107	103	98	96	112	112	93

a) Enter the data into your calculator in L1, and then run 1-var stats. Record the sample mean, the sample standard deviation, and the sample size. $\bar{x} = 105.758$ $s = 13.868$

$n = 33$

b) Check the conditions

1) SRS ✓ 2) $n \geq 30$ ✓ 3) pop ≥ 330 ✓

c) Create a 98% confidence interval for the **average** IQ score for seventh-grade girls.

$$\bar{x} \pm t^*(s/\sqrt{n}) = (99.846, 111.67)$$

We are 98% confident that the true avg. IQ score for 7th graders is btw. 99.846 and 111.67 points.

d) The average IQ score for any age group is supposed to be 100. Use the information in this problem to test and see if the **average** IQ score is different from 100. Use $\alpha=0.03$.

$H_0: \mu = 100$

$H_a: \mu \neq 100$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = 2.385$$

$$2 \cdot P(t > 2.385) = 0.023$$

$\alpha = 0.03$

- We reject Ho b/c p-value < $\alpha = 0.03$
- We have sufficient evidence that the true avg. IQ score for 7th graders is not equal to 100 pts.

2- Complete #40 and 41 on page 594 in the textbook.

40) Ho: $\mu = 18$

Ha: $\mu < 18$

* faster time means <

41) Ho: $\mu = 2.6$

Ha: $\mu \neq 2.6$

3- An environmental group collects a liter of water from an SRS of 45 locations along a stream and measures the amount of contamination in each specimen. The average of the sample is 4.62 milligrams and the standard deviation is 0.92 milligrams.

a) Check the conditions

1) SRS ✓ 2) $n \geq 30$ ✓ 3) pop > 450 ✓

b) Create a 95% confidence interval for the average amount of contamination in the stream

$\bar{x} \pm t^* \cdot (s/\sqrt{n}) = (4.3436, 4.8964)$

We are 95% conf. that the true avg. contamination level is btw 4.3436 and 4.8964 mg.

c) It has been claimed that the contamination level in the stream is 5 milligrams. Using the info in this problem, test to see if stream's contamination level has decreased.

Ho: $\mu = 5$

Ha: $\mu < 5$

$t = \dfrac{\bar{x} - \mu}{s/\sqrt{n}} = -2.771$

$P(t < -2.771) = 0.0041$

$\alpha = 0.05$

- We reject Ho b/c p-value < $\alpha = 0.05$
- We have suff. evidence that the true avg. contamination level is less than 5 mg.

4- What is Inference?

an educated guess about a population based on data.

5- What is inference based on?

Sampling distributions

6- When dealing with averages, what symbol represents the unknown population average (claim)?

μ

7- When dealing with averages, what symbol represents the sample average?

$\bar{X}$

8- I have a 94% confidence interval that is (45.6, 59.3).

a) Suggest a possible 98% confidence interval wider (40, 65)

b) Suggest a possible 91% confidence interval skinnier narrower (48, 55)

9- What 2 things can you do to decrease the margin of error in a confidence interval?

1) increase n
2) decrease conf. level.

10- I have a confidence interval that is (32.9, 48.4)

a) What is the sample mean? 40.65

b) What is the margin of error?

7.75

11- What is a P-value? What is it really telling us about our sample? likelihood of getting our sample

probability of getting our sample or something more extreme.

12- What does it mean if a sample is significant?

- reject Ho
- p-value $< \alpha = 0.05$

13- A recent study claims that by May, 65% of statistics students will have "senioritis." You believe that this **proportion** is actually lower (one reason being that not all statistics students are seniors). You take a SRS in May of 93 stat students (between all three CB High Schools) and find that 42 of them claim to have "senioritis." Test your claim at a significance level of 0.05.

$H_0: p = 0.65$

$H_a: p < 0.65$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = -4.011$$

$P(z < -4.011) = 3.023 \times 10^{-5}$

$\alpha = 0.05$

Conditions

1) SRS ✓
2) $n \geq 30$ ✓
3) pop $\geq$ 930 ✓

- we reject Ho b/c p-value < $\alpha = 0.05$
- we have suff. evid. that the true prop. of students w/ Senioritis is less than 65%

14- A company is marketing its new toy for children ages 3-8, however they are interested in the **proportion** of 4 to 5-year-old children like the toy. They take a SRS of 53 4 to 5-year-old children and perform a series of tests to determine whether the child likes the toy or not. They determine that of the children in their sample, 28 like their toy. Using a 96% level of confidence, estimate the percent of children that like the toy.

$$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$= (0.38748, 0.66913)$

Conditions

1) SRS ✓
2) $n \geq 30$ ✓
3) pop $\geq$ 530 ✓

We are 96% conf. that the true prop. of children who like the toy is btw. 0.38748 and 0.66913.